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OBSERVATIONS PERTAINING TO A POTENTIAL SCALE
INSECT ENEMY OF CALIFORNIA PINES

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OBSERVATIONS PERTAINING TO A POTENTIAL SCALE INSECT ENEMY
OF CALIFORNIA PINES*

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The importance of scales as injurious forest insects has been brought to light by recent studies conducted by the Bureau of Entomology and Plant Quarantine. Among those that stand out in the western region are scales belonging to the genus Matsucoccus, family Margarodidae, that confine their attacks to pines. The effect of these insects in the pine forests is definitely one of injury to twigs and branches, weakening of the crowns and deformation of the younger trees. This has been recently substantiated by detailed studies of the Prescott scale, Matsucoccus vexillorum Morrison in Arizona.

In the California region a preliminary survey of the Matsucoccus forms indicates that there are half a dozen or more species that appear to be definitely connected with injury to pines, and of these Matsucoccus bisetosus Morrison has been found to have the most potentiality as a forest scale pest in this state.

The data included in this preliminary paper have been assembled in order to present the fragments of information that have been accumulated on this scale insect during the past two years. It is on the basis of this evidence that the Bureau of Entomology and Plant Quarantine, Division of Forest Insects, has undertaken to further study this interesting scale problem.

* Matsucoccus bisetosus Morrison (Homoptera: Margarodidae).

What does the scale do to pines?

Bark roughening: Matsucoccus bisetosus scale attacks both young and mature ponderosa and Jeffrey pines in California forests. It infests the twigs, branches and trunk of all age classes. On mature trees its attack on the trunk is limited principally to the upper crown. Bark cracking and roughening on the stems and branches is apparently associated with infestations of this scale insect (Figure 1).

Insert Figure 1

Needle shortening and thinning: Presadults (larvae) of the bisetosus scale are commonly observed in the crotches where the small branchlets arise from the larger stems. In these crotches much resin ing is evident as globules on the bark surface, and oftentimes extending into the cortex tissue (Figure 2, left). This crotch resin ing appears to retard

Insert Figure 2.

normal physiological functions of the infested branch. Needle shortening and thinning of needle complement seems to be commonly associated with such injury (Figure 2, right).

Branch killing or flagging: Apparently as a result of extended scale feeding on the stems and in the crotches of small branchlets, the branch ultimately flags or dies. The first evidence of a flagged branch is the gradual fading of the foliage to a pea-green color, and as the season progresses, to a deep sorrel (Figure 3). Flagged branches are quite conspicuous at first.

Insert Figure 3

but as the season continues and the needles fall off, they become less and less noticeable.

Where does the scale occur?

Matsucoccus bisetosus scale infestations appear to be rather generally spread throughout the pine stands of the Pacific Northwest. Outstanding collection records pertaining principally to injury produced by the scale are listed chronologically below:

Locality	Date & Collector	Host	Injury Caused by the Scale
Hat Creek, Shasta County, Calif.	August 23, 1938 H. L. McKenzie	<u>Pinus</u> <u>ponderosa</u>	Needle thinning, branchlet crotch resinizing, bark roughening and flagging on juvenile trees.
Burns, Oregon	Nov. 26, 1938 F. P. Keen	<u>Pinus</u> <u>ponderosa</u>	Pale and short needles, canker-like swellings on twigs and badly deformed main lateral leaders on young to middle aged trees.
Middletown, Lake County, Calif.	Aug. 24, 1939 H. L. McKenzie	<u>Pinus</u> <u>ponderosa</u>	Reduced needle complement, branchlet crotch resinizing and excessive branch flagging. Mature trees subsequently attacked by bark beetle.*
Black's Mt. Experimental Forest, Lassen Co., Calif.	Oct. 1939 J. W. Bongberg J. M. Miller	<u>Pinus</u> <u>ponderosa</u>	Reduced needle complement, current needle shortening, branchlet crotch resinizing, branch flagging and subsequent attack by bark beetles on a marked experimental mature pine.**
Black's Mt. Experimental Forest, Lassen Co., Calif.	Nov. 7, 1939 H. L. McKenzie	<u>Pinus</u> <u>ponderosa</u>	Reduced needle complement. Current needle shortening, branchlet crotch resinizing, and branch flagging on mature trees.**
Corte Madera, Lagunas Area, Southern Calif.	Nov. 10, 1939 J. M. Miller S. T. Carlson	<u>Pinus</u> <u>jeffreyi</u>	Branchlet crotch resinizing and excessive branch flagging on mature trees.
Cuyamaca State Park, Lagunas Area, Southern California	Nov. 11, 1939 J. M. Miller	<u>Pinus</u> <u>jeffreyi</u>	Adventitious buds on stems and branch flagging on mature trees.

* The species of bark beetles concerned were Ips confusus Lec. and Dendroctonus brevicomis Lec.

** The collected branches were actually infested with three species of Matsucoccus scale. Matsucoccus bisetosus appeared to be the most abundant species. The other species were Matsucoccus californicus and Matsucoccus sp. (either new or perhaps secretus).

What are its Potentialities as a Forest Problem?

So far as preliminary observations go it would seem possible that this scale insect may be one of the important factors in decadence of mature ponderosa pine and Jeffrey pine forests which supply the California lumbering industry. One can readily visualize how Matsucoccus bisetosus scale infestations on the branchlets and stems might contribute to the decadence of mature pines. The gradual killing of the smaller branchlets and stems would ultimately lead to large branch killing. The needle complement being much reduced as a result of scale activity would, no doubt, influence tree vigor, and it seems reasonable to assume that such weakened trees would be much more susceptible to bark beetle attacks.

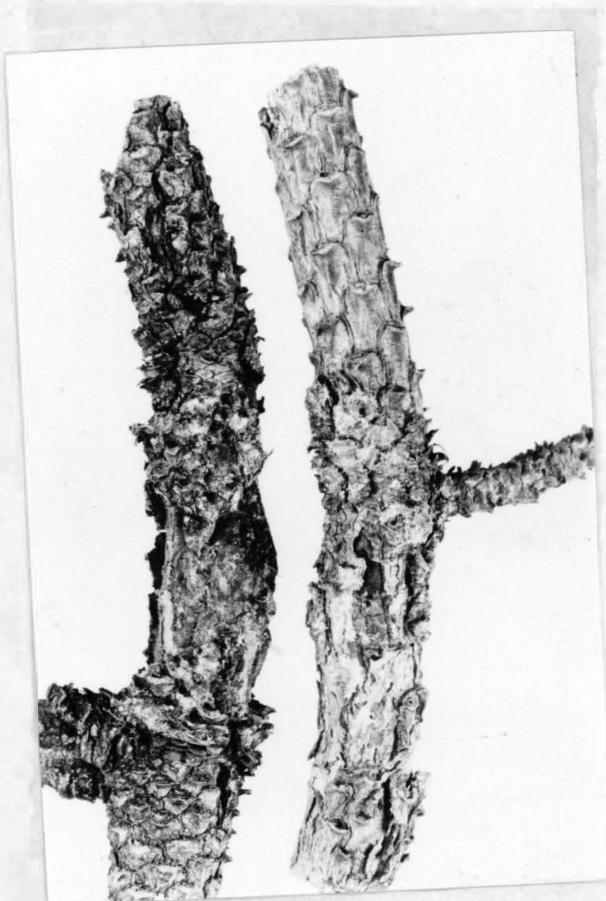


Figure 1. Stems collected from Matsucoccus bisetosus scale infested trees near Middletown, Lake County, California. The cracking and roughening of the bark is apparently associated with infestations of scale. Resining is also noted on infested stems particularly in the branchlet crotches where feeding scale insects are commonly found.



Figure 2. Left: Branch from a decadent mature ponderosa pine tree on the Black's Mountain Experimental Forest, Lassen County, California, infested with Matsucoccus bisetosus Morrison scale. The pre-adults of this scale are commonly found feeding in the branchlet crotches, and in such crotches resin is usually present as glebules on the bark surface, and oftentimes extending into the cortex tissue. The arrows point to resin in one such crotch.

Right: The current needles on these scale infested stems are apparently much shortened, and it is believed that this may be the result of scale feeding.

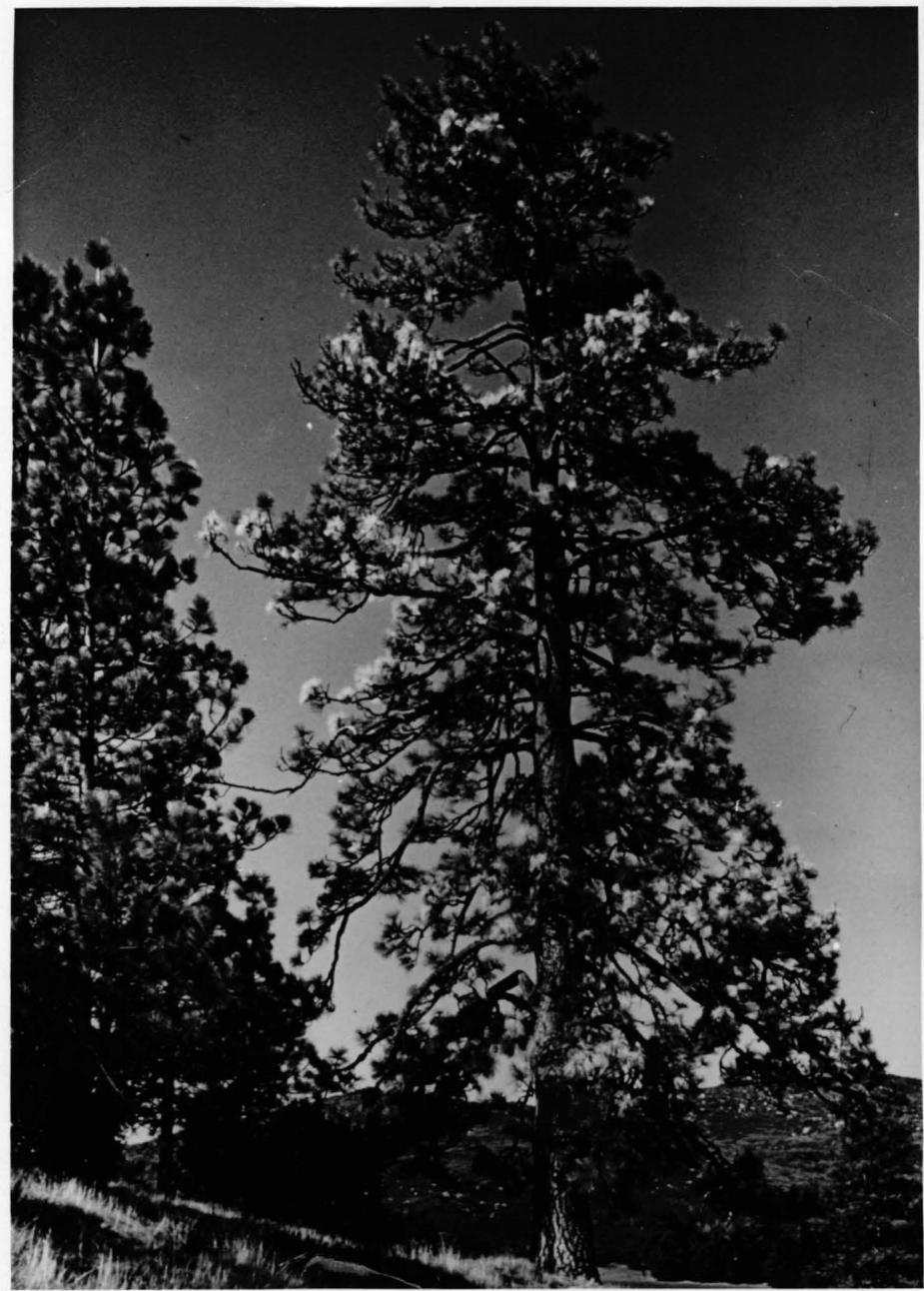


Figure 3. A mature Jeffrey pine tree infested with Matuseccus bisetosus scale located at Corte Madera, Cleveland National Forest near San Diego, California. The gradual killing of the branches by the feeding activities of this scale insect ultimately puts the mature pines in a state of decadence, and this type of tree appears to be more susceptible to bark beetle attacks. Photo by J. M. Miller.